DOCUMENT RESUME

ED 086 908 CG 008 242

AUTHOR	Schroder, H. M.; Schutzius, Robert
TITLE	A Concept Training Model for Academic Curriculum Development.
PUB DATE	May 73
NOTE	23p.; Paper presented at the North Central Association Meeting, 25-29 March 1973, Chicago, Illinois
AVAILABLE FROM	21p.; Paper presented at the American Personnel and Guidance Association, 23-27 May 1973, Atlanta, Georgia
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	College Students; *Concept Formation; *Curriculum Development; Information Processing; *Information Seeking; *Models; Program Descriptions; *Social Problems; Speeches; Theories

ABSTRACT

The authors present an educational method based on Information Processing Theory that utilizes student information search and concept formation as a foundation for writing reports on selected real world problems. The method requires the development of a data library which contains information (e.g., financial, economic, social, political) relevant to the participating disciplines. Students work problems by submitting written questions to retrieve data. In addition students develop an information system relevant to their own career planning. This report covers theoretical foundations, description of an operational program and evaluation of the first full year of operation. Concept Training Students (substituting 50 percent reduction in contact hours with problem laboratory work) equalled a matched group of students in the regular program in the acquisition of knowledge, and showed a significantly greater increase in conceptual ability and motivation. (Author)

ED 086908

ROUGH DRAFT

A CONCEPT TRAINING MODEL FOR ACADEMIC CURRICULUM DEVELOPMENT

H. M. SCHRODER, R. SCHUTZIUS, C. A. ARMITAGE

Southern Illinois University
Edwardsville, Illinois 62025

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Paper presented at the APGA meeting in Altanta

May 1973

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INFORMATION PROCESSING THEORY AND CONCEPTUAL DEVELOPMENT

H. M. Schroder

Introduction

Conceptual development, in any domain is broadly defined as to movement away from the use of externally given evaluative concepts in judgment and decision making toward more complex information processing whereby a person searches for information and actively combines attributes or kinds of information in different ways thus forming multiple concepts. A concept represents a way of construing a stimulus (e.g., a person or an event); it is a perspective or a reality - a way of selecting, perceiving, evaluating and behaving. Such realities can be delivered to us ready-made (i.e., concepts can be externally anchored) or they can be self generated by combining two or more attributes of information. Environments for concept development foster the self generation of multiple concepts or realities as tools for thought and judgment (Schroder, Driver & Streufert, 1967; Schroder, Karlins & Phares, 1973), e.g., as a basis for making occupational judgments.

Conceptual development - this self generation of multiple concepts - is the most challenging and formidable endeavor an individual can undertake. Under conditions of accelerated change and accompanying uncertainty there is an increasing tendency to reduce this uncertainty by latching onto a ready-made reality (a ready-made way of perceiving and behaving in the new situation). In this way we can quickly return to the comfort and a false sense of feeling of self control.

The history of western man can be viewed as the development and supremacy of those institutions which were able to provide him with ready-made realities for coping with the stress of change. Initially, man worshipped to be controlled, he worshipped for an external anchor to give him comfort and support in a world whose events he did not understand. In the course of events those with power capitalized on this need by providing "realities" which the masses adopted. These concepts were skillfully designed to achieve the goals of leaders and institutions (for example, in regard to work, family organization, conduct) to keep the masses under control and working in the interests of the elite (e.g. see the history of the Reformation). Over time - and through revolutions - more and more of the masses sought and won the right to impose their own "realities." Today it has become a complete science with a large proportion of our resources devoted to the creation and the imposition of "realities" through more and more sophisticated means of manipulation (behavior control, norms).

The imposition of externally generated concepts is a very, very effective means of controlling and/or imposing change on individuals, groups and nations. Authorities and institutions can direct or change people easily and quickly - it is simply a matter of prescribing a reality and using behavior control methods to ensure the prescription is adopted. The effect of increasing democratization has been to permit a wider range of "authorities," who possess the rewards needed to prescribe and impose realities. In fact, democratization has accelerated the movement of the masses toward the adoption of an externally anchored self. As Fromm so well described - under conditions of uncertainty people "escape from freedom." In our terms they escape from the "risks" involved in self change and are overly motivated to adopt ready-made or ready-packaged realities and the promised rewards.

Our educational institutions have also capitalized on this method of achieving individual change or "development." Students are essentially given prepackaged concepts and procedures (via the textbook and lecture technology supplemented by teaching machines and other supports) and are rewarded for utilizing these concepts in approaching problems during and at the end of their courses. Occupational choice is often made on the basis of an externally prescribed reality - by norms or a parent - which is alien to the individual's self.

So, in the latter part of the 20th Century the nature and direction of self-change (socially and educationally) is largely determined outside of oneself and these externally determined goals were not designed to be concerned with the intrinsic welfare of the individual (Schroder & Crocker, 1973). Thus, despite the materials and economic advances the externally anchored system provides, the individual continues to feel a lack of identity, a lack of self or internal control, an inability to experience himself or events directly and a general lack of intrinsically aroused interest and excitement.

Conceptual Development

Concept training provides an individual with the tools for internally anchored thinking and self-generated change. The aim of concept training environments is to develop the conceptual processes involved to achieve a balance between the internally and externally anchored systems of development and change.

Conceptual development implies an increase in information processing activities of the individual. It is defined as the self generation and utilization of an increasing number and informationally rich concepts persons

use in thinking and judgment in any domain. That is, conceptual development is defined in terms of:

1. The number of concepts or perspectives a person uses, e.g., in the educational domain it is defined as the use of multidisciplinary concepts (economic, social, financial, psychological, organizational) in making judgments about societal problems; in the interpersonal domain as the use of multiple conceptions (intellectual, social, task) in making judgments about other people; and in the occupational domain as the number of concepts (e.g., regarding job opportunities, skills, motivation, interests) the person uses in making occupational choices.
2. The informational richness of each concept. A concept combines the various attributes (or scale values) or information (Warr, Schroder & Blackman, 1969). Some concepts have little informational support, for example, concepts based on a single attribute of information about another person such as skin color or belief. On the other hand, more enriched concepts are formed on the basis of many kinds of information - belief, interest, knowledge, and so on.

At higher levels of conceptual development persons: (a) generate or search for more kinds of information, (b) form multiple concepts on the basis of this information and (c) utilize these multiple concepts in judgment and thinking. Like other abilities, conceptual development need not be at the same level in all domains. Persons can, as a result of their training, be high in one area (e.g., in conceptualizing about

themselves or other people) and low in another (e.g., in conceptualizing about religion). That is, a student could develop to a higher level of conceptual functioning in mathematical subjects than in social science subjects when amount of knowledge acquired in each was constant (Schroder, et al., 1973).

Higher levels of conceptual development in one domain implies a greater number of perceptual categories for receiving information about the world, and more combinatory rules or concepts for organizing such units of information. When we speak of a person possessing "a greater number of perceptual categories for receiving information about the world" we are referring to his ability to generate more information relevant to his needs. When we refer to "more combinatory rules for organizing such units of infomration" we are speaking of the individual's ability to form multiple concepts on the basis of this infomration and to use these concepts or hypotheses in a creative manner in problem solving. These two hallmarks of well developed information processing skills - information generation and concept formation (and utilization) - represent the criteria for conceptual development. (Schroder, Karlins & Phares, Education for Freedom, 1973)

Definition of Concept Training Environments:

A. Operations for Laboratory Training Procedures

Laboratory studies have shown that individuals can be directly instructed to form multiple informationally rich concepts and to utilize these more complex conceptual properties in judgment (Schroder, 1971; Faletti, 1968; Lee, 1968; Carrington, 1968; Gardiner, 1972). In these studies, subjects were given attributes of information (intelligence,

empathy, assertiveness, thoroughness) about applicants for a hypothetical position. They were instructed to form concepts about the applicants based on two or three scale values (ratings on attributes). This variation in the number of attributes used in concept formation defines variations in informational richness. Groups of subjects were also instructed to form either one or two concepts using the same scale values of information for each concept, for example, to form one concept from a social perspective and one from a task perspective. Different concepts represent different weightings of attributes. This defined differences in the number of concepts. A total of approximately eight (8) hours training time was given in four weekly sessions. Subjects then used either single or multiple concepts (varying in informational richness) to make judgments about the applicants. These judgments demonstrated that variations in direct concept training did produce expected differences - namely that the formation of multiple informationally rich concepts is expressed in judgments in the specific training situation.

B. Operations for Field Training Procedures

In order to develop field process or concept training environments it is necessary to design the training situation so that the trainee must learn solely through exercising the processes required for the development of multiple informationally rich concepts - that is, through the use of the two related operations specified above, namely, (1) information generation and (2) multiple concept formation and utilization in judgment.

The field training environment, then, must be designed so that the trainee can, and in fact must, reach his goal, e.g., occupational choice, via:

1. Information search - the generation of many kinds (attributes) of information about the stimuli (e.g., self) and
2. The formation of multiple concepts on the basis of differential weightings of this information.

The utilization of multiple concepts or hypotheses in judgment and the consequent generation of descrepant feedback arouses intrinsic interest or interest in the task for its own sake - which is an essential property of any effective concept or process training environment (Hunt, 1971; Berlyne, 1965). That is, concept training is a process of learning through concept development, information search, feedback and concept modification.

The training format described in this paper was implemented in an academic program. Our interest here was mainly to study conceptual, motivational and educational development in this environment. However, from a theoretical viewpoint we expect that "process environments" in education will facilitate the maturity of judgments about self, e.g., occupational judgments. Dr. Schutzius (in the next paper) will specify the factors in this environment which are most relevant to "self" growth, e.g., learning to search for relevant information and forming self generated multiple concepts; using self-made concepts to approach a variety of real world problems, forming and using interdisciplinary concepts, working cooperative toward shared goals, and working independently in developing the conceptual processes. This work is described in a new book called Education for Freedom published by Wiley and Sons, 1973. We have begun to develop a concept training program for individuals in the area of occupative judgment. But this is still in the early developmental stages.

DESCRIPTION OF THE CONCEPT TRAINING MODEL

R. Schutzius

Thus far, we have talked about concept training and the importance of creating environments for concept development. In my presentation I would like to share with you our first attempt at developing such an environment in an ongoing university program.

The Management Problem Laboratory Program (MPL)

The Management Problem Laboratory Program (MPL) originated at Southern Illinois University in Edwardsville in the 1970-71 academic year with a group of 80 juniors who were beginning their first year as business majors. Twelve junior courses are taught over three quarters, all required for business majors. The courses cover management, computer programming, economics, marketing, statistics, accounting and finance.

The concept training environment centers around the problem laboratory which contains factual data concerning selected real world problem areas. A different problem is selected each quarter such as, an urban housing community, a quick food franchise, and an automobile dealership. The students at the beginning of each quarter are given a problem statement which requires application of the principles under study in the four courses to the data they can obtain from the problem laboratory. Students are to make recommendations in a written report due at the end of the quarter on strategies for solving the problems under study, by gathering data through forming and submitting written questions to the problem laboratory operators who retrieve the requested information. They carry out their own information search and use the data obtained to develop ideas and write reports. It is a process of learning through concept development, i.e. (formation of an

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idea as to what might be the source of the problem), information search (information requested from the problem laboratory), feedback and concept modification (on the basis of the information received the original idea is changed, confirmed or discarded and new ideas generated to be tested by further information search, feedback, etc.).

The actual implementation of this took some doing. Fortunately, we were given the resources to bring it all about. Well in advance of the first day of class, the participating professors of that quarter carefully select a problem statement which require the student to apply all the concepts or knowledge of each course in writing of one comprehensive report which would give recommendation for solving the problem. The professors then list the data which they feel might be required to deal with the problem. The data is then collected by an assistant in cooperation with the participating organization whose business problems are under study. The above tasks require maximum effort each in themselves. For instance, in the urban apartment complex, the professors must agree on a single problem statement, a list of data needs must be compiled, and literally thousands of units of data must be generated including demographic data, data on existing and past tenants; financial, economic, marketing, legal and accounting records, data on community facilities, recreation and crime, data on the area, industry, universities, schools, zoning, social political climate, transportation, etc. The data is then organized and stored as an information library or data library in the problem laboratory. Thus we have the informationally rich environment necessary to focus education on the process or conceptual development.

At the beginning of the quarter, the problem is presented to the students who then must formulate written questions in order to retrieve data from the data library. Only questions which seek data can be answered. Initially, the students ask evaluative questions such as "Is service to the people adequate?"; but soon discover that they must arrive at their own evaluative judgements based on factual data. In the beginning they find it difficult to form ideas or concepts and tend to engage in more or less random information search. Questions are submitted on a special form which ask the student: a. to state his idea, concept or hypothesis about the problem, and b. to list relevant questions. The full meaning of what the form requests is usually not understood until the overload of information begins to force the development of an idea or hypothesis as a basis for guided search. As skills improve the students begin to formulate alternative hypotheses and seek data with a greater range of relevance. The students are formed into groups of five where data individually or collectively obtained can be discussed and concept evaluated. Each individual is encouraged to use the team as a support for developing his report. Since team members have a common problem and goal, small group interaction is stimulated and the processes of concept development facilitated.

The criteria for grading include the process of concept formation as well as the context. All course instructors grade the single report which each student submits. Preliminary reports are called for to give feedback to the students from the instructors but these are not included in the grading. Instructors are trained to grade the reports on this criteria. The first is knowledge which is defined as how well the students apply the

concepts and content of each course to the problem. The students are specifically instructed to consider all knowledge (from lecture, texts and additional readings) in dealing with the problem and to report on its relevance. Each instructor grades each report on the breath and understanding of the knowledge of his course used in dealing with the problem. The second criteria is concept formation and utilization. This includes the number, differentiation and statement of concepts ideas of hypothesis formed about the problem. The third criteria is information search. Each instructor rates the amount of information and data searched and considered in relation to concept development, modification, and multiple concept utilization in making recommendations in the report. Students are instructed as to the details of the grading.

Usually, a student will undertake at least four courses each quarter. These courses cover the disciplines of accounting, business administration, economics, finance, management science and marketing. One one-hour lecture and one on-hour class is allocated to each course per week. In addition, each student attends two one and one-half hour interdisciplinary problem laboratories per week. That is, for the regular four course program in each quarter, students attend four hours of lectures, four hours of class work and three hours of management problem laboratory. The total of 11 hours of required course work is approximately 30 per cent less than the 16 hours of class work in the regular program. However, three of the eleven hours involve independent MPL work so that the instructor-student contact is reduced by 50 per cent as compared to the regular program. In addition to the four courses each quarter, three optional courses are offered on a continuing basis, i.e., over a three quarter period.

The Counselor's Role

A coordinating counselor was part of the staff for the pilot program and his skills were put to good use. The level of uncertainty and frustration in the students ran quite high since they were unaccustomed to learning through generation of their own questions and hypotheses. In their previous educational experience they received prepackaged ideas to be studied and internalized. Not given these, they needed structure and reassurance until enough confidence is developed in their own internal conceptual resources. The program is designed to be flexible so as to adapt to student needs. The counselor was to be aware of these needs and make recommendations for program changes and facilitate their implementation. The faculty too, were as unaccustomed to the formal as were the students, and the counselor was helpful in working out the compromises required to reconcile faculty, student, and program needs. In the area of measurement, he worked closely with the research team in obtaining data about student change and growth. A series of studies of the relative effectiveness of the described concept training program has begun and the results of several are now known.

Other Educational Perspectives

Growth

As the students develop their multiple concept utilization skills in business areas there takes place some transition of these skills in other areas. Personal decisions and life styles long established undergo re-evaluation. The counselor is helpful in this area as one with whom the new insights can be shared and explored without threat.

Choice

The interdisciplinary aspect and real world structure of the problems enable the students to see more clearly just what the business world is all about. This knowledge is enough for some to quickly change their major from business and for others to further determine their specialization in the business world.

Cooperation Versus Competition

At first the students are quite guarded with the data they have obtained from the data library and ideas that they individually have. Over the three quarter period, we find that this individual competitive approach breaks down within the team and then between teams in favor of cooperation and sharing of insights.

Cumulative Enrichment

The role of the instructor is somewhat changed in this environment. While he presents his course material he also is involved in the problem formulation; data acquisition and he acts as consultant to the students. As the program continues, the expertise of the different instructors remains to be improved on by new instructors. Since the problem is interdisciplinary the instructor interdisciplinary experience is tapped by the students. As a result of the cumulative effect and interdisciplinary approach learning in

the program is less and less dependent on the charisma of the individual instructor.

EVALUATION OF A CONCEPT TRAINING EDUCATIONAL PROGRAM

C. A. Armitage

A series of studies of the relative effectiveness of the described concept training program has begun and the results of several are now known. The criteria which are being used to evaluate the effectiveness of the program are:

1. Knowledge acquired across participating disciplines.
2. Conceptual ability - the ability to use a broader range of inter-disciplinary information and concepts in coping with business and societal situations.
3. Motivation for independent work.

Results as to each of these will be examined in turn.

Four studies have been completed concerning knowledge acquisition. In the first, a test to compare accounting majors in the experimental group, i.e., those participating in the Management Problem Laboratory Program, and a group of accounting majors in the regular program was conducted. A standardized accounting test, the American Institute of Certified Public Accountants (AICPA) Achievement Test, Level I, Form C-S, was administered to experimental students specializing in accounting and to a group consisting of accounting majors in the regular program. The two groups were comparable to the extent that the cumulative grade point average of both was 3.6. The two groups differed, however, in the number of accounting courses completed prior to taking the AICPA test. The mean for the experimental students and the comparison group was 2.15 and 2.48 respectively. The "t" test revealed that the comparison group had completed significantly more accounting courses than the experimental students prior to testing ($t = 2.01 < .05$). The mean scores on the AICPA test for the experimental and comparison group students.

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were 17.00 and 18.58 respectively. This difference is not statistically significant and this suggests the that the MPL format did not result in inadequate accounting content acquisition as compared against the test scores of students in the regular accounting program.

The second study examined content or knowledge acquisition using a measure called the Test of General Business Knowledge. This measure is a 60-item multiple-choice test which samples content in five business core areas: (1) accounting and finance, (2) general business administration, (3) management science, (4) economics and (5) marketing. It was developed using item analyses from an original pool of 125 items submitted by each department in the Business Division.

The Test of General Business Knowledge was administered on a post-program basis to students who had participated in the experimental program and to a control group of business students, matched for courses taken and grade point average. Results yielded means for the experimental and control groups of 39.6 and 38.5, respectively. This difference is not significantly different and the suggestion is clear that content acquisition in the experimental program was not significantly different than content acquisition in the control group.

The third study compared the experimental group and a control group of students taking a class in finance. The course was taught in the experimental program as an optional, continuing course. That is, only students interested in completing the course requirements in addition to their normal course load were enrolled. In the experimental program, the course was presented through a total of six formal lectures and two special sessions delivered at the request of the students. The total contact time was 12 hours over a five-

month period. The mean entering grade point averages of both the control and experimental students was 3.5. However, the experimental students entered the course with fewer credit hours (101 compared to 136 hours for the control group) and the experimental students were taking on an average of 18.8 credit hours while those in the control group were taking an average of 13.9 credit hours. Identical examinations were administered to the experimental and control groups. The mean scores were 35.6 and 37.6 respectively. There was no significant difference between the two groups.

The fourth study examined knowledge attainment in a course in economics. The experimental group was compared to a control group that was composed solely of economic majors and minors. On the first class day, a multiple choice examination was administered to both groups. On the last class day both groups were post-tested with the same examination. The results indicated no significant difference between the groups on either the pre- or post-test with respect to content.

The second criterion is the evaluation of the effectiveness of the concept training environment concerns the students ability to use multidisciplinary information and concepts in dealing with business, societal and social problems. The first investigation was a part of the previously mentioned study in economics. After the administration of the post-test (which found no significant differences between the experimental and control groups with regard to level of knowledge attainment), both groups were asked an essay question to examine conceptualization. In this study conceptual ability was measured by assessing the degree to which students utilized economic information and concepts in decision making in general societal problems. The results indicated that students in the experimental program demonstrated a significantly

higher level of conceptual ability than students in a special control group at the end of the program. That is, in study demonstrated a significant treatment effect on the generalization of information processing ability.

In the second study, conceptual ability in the social domain was assessed using the paragraph completion test - a standardized measure of the number of concepts used in social judgment. The test was administered to experimental and control group students (matched by courses taken and grade point average) in September, 1971, and in May, 1972. Scores for students in the experimental program increased on the average of 1.67 compared with an increase of 1.00 for the control students. This difference just fails to meet the 5 per cent level of significance ($t - 1.35$ $P < .06$).

The third study, conducted on a post-program basis, investigated the range and depth of information search which control and experimental group students brought to bear on an actual business problem. The problem presented to the experimental and control group students was to develop a strategy or strategies for increasing the profitability of a local automobile dealership over the next five years. Students could ask factual questions about the firm as a basis for writing their report. A time limit of three hours was allowed. The results showed that the experimental group asked significantly more questions (28.08 vs. 15.52) and that these questions covered a significantly broader range of information categories than the control group (16.03 vs. 10.67). Such a difference might be attributed to the direct effect of the training in information search received by the experimental group.

The third criterion chosen was motivation. Achievement motivation was measured using the McClelland modification of the Thematic Apperception Test

and scoring manual. The TAT was administered in September, 1971, and again in May of 1972 to experimental and control group students again matched as previously stated. Change scores were calculated showing a mean increase in achievement motivation of 1.44 for the experimental group and .50 for the control group. This increase is highly significant.

Further, the amount of independent work carried out by a student constitutes an objective measure of motivation. Although unable to obtain a direct assessment of the amount of time spent or the quality of independent work, the results of the studies outlined above are consistent with the hypotheses that the students in the experimental program engaged in more independent work. The alternative hypotheses, that the reduced schedule of instruction was superior, is not supported by studies which control for the instructor variable.

To summarize what has been here reported:

1. Four studies show no significant difference in the amount of knowledge by students in the problem laboratory and regular programs. That is, students in the problem laboratory program scored as well as students in the regular program on objective tests of knowledge in (a) general business administration areas, (b) accounting, (c) finance and (d) economics.
2. Three studies investigated the effects of the problem laboratory program on the student's ability to use multidisciplinary information and concepts in dealing with business, and social problems. The studies show that the problem laboratory trained students score significantly higher on conceptual ability, than students in the regular program in economic, management, and marketing

case problems. Further, one study demonstrated that this ability transferred to the analysis of general societal problems outside the specific course area.

3. Significant increases in motivation for the problem laboratory students, compared to regular program students, were indicated by: (a) An increase in achievement motivation measured by the McClelland Achievement Test, and (b) the ability of the problem laboratory students to compensate for the 50-60 per cent reduction in student-instructor contact.

These studies suggest that the concept training methodology is feasible and that further development and research is indicated. Research during the current academic year shall evaluate (using the aforementioned criteria) the relative effectiveness of the traditional program of instruction, the case study method, and the problem-oriented, interdisciplinary program.